

**REMARKS**

Claims 1-20 are all the claims pending in the application. By this Amendment, Applicant amends claims 1-3, 14, and 16 to further clarify the invention. In addition, Applicant rewrites claim 8 into its independent form and claim 10 back into its dependent form.

I. Summary of the Office Action

The Examiner withdrew the previous rejections. The Examiner has also withdrawn the previous indication of allowability of claims 10 and 18 in view of new grounds for rejection.

Specifically, claims 16-18 are rejected under 35 U.S.C. § 112, first paragraph, claims 14 and 16-18 are rejected under 35 U.S.C. § 112, second paragraph, claims 1-5, 9, 10, 14, 15, and 20 are rejected under 35 U.S.C. § 102 and claims 3, 6, 7, 11-13, and 15-19 are rejected under 35 U.S.C. § 103. Claim 8 contains allowable subject matter.

II. Claim Rejections under 35 U.S.C. § 112, first paragraph

Claims 16-18 are rejected under 35 U.S.C. § 112, first paragraph. Specifically, the Examiner alleges that the specification does not provide adequate support for the number of regenerators depending at least partially on the number of channels in the transmission system (*see* page 2 of the Office Action). Applicant respectfully traverses this rejection in view of the following comments. If a regenerator regenerates only one channel, as required in claim 15, then the number of regenerators will depend on the number of channels, *see e.g.*, page 5, lines 9 to 26 of the specification. In view thereof, Applicant respectfully requests the Examiner to withdraw this rejection of claims 16-18.

III. Claim Rejections under 35 U.S.C. § 112, second paragraph

Claims 14 and 16-18 are rejected under 35 U.S.C. § 112, second paragraph.

With respect to claim 14, Applicant respectfully requests the Examiner to withdraw this rejection in view of the self-explanatory claim amendments being made herein.

With respect to claim 16-18, Applicant respectfully traverses this rejection in view of the following comments. The Examiner alleges that the phrase “depends at least partially” is unclear and renders the claim indefinite (*see* page 3 of the Office Action). To begin, Applicant respectfully submits that the Office Action fails to substantiate this ground of rejection. That is, the Office Action fails to clearly set forth the reasons why the phrase is viewed indefinite.

Applicant respectfully submits that this phrase relates to the breadth of the claim and is definite. MPEP § 2173.04 recites “breadth of a claim is not to be equated with indefiniteness.” In the present case for example, in determining the number of regenerators, one of many considerations is the number of channels in the transmission system. Accordingly, the number of regenerators depends at least partially on the number of channels in the system. If Applicant was to recite all considerations that determine the number of regenerators, this would relate to the breadth of the claim and not to its definiteness. Therefore, Applicant respectfully requests the Examiner to withdraw this rejection of claims 16-18.

IV. Claim Rejections under 35 U.S.C. § 102

Claims 1-4, 9, 10, 14, 15, and 20 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,480,312 to Okuno et al. (hereinafter “Okuno”) and claims 1, 2, 5, 10 and 20 are rejected under 35 U.S.C. § 102(b) as being anticipated by WO 98/05133 to

Grasso et al. (hereinafter “Grasso”). Applicant respectfully traverses these rejections in view of the following comments.

***Claims 1-4, 9, 10, 14, 15, and 20 are not anticipated by Okuno***

Of the rejected claims, only claim 1 is independent. Independent claim 1, among a number of unique features requires: “each one of the set of channel regenerators regenerates, by compensating for a distortion of a signal, only a predetermined respective group of channels, each respective group forming a non-overlapping subset of a set of channels to be regenerated, and each channel of the groups is predetermined based on channel wavelength.” The Examiner contends that Okuno’s amplifiers 41 and 44 discloses the regenerators that regenerate only a predetermined group of channels (*see* page 4 of the Office Action). Applicant respectfully disagrees.

The newly found reference, Okuno relates to a dispersion compensating system for bi-directional optical communication using wavelength division multiplexing transmission. Specifically, Okuno discloses a first and second optical transceivers 1 and 2, between which bi-directional transmission is carried out with signal lights having different wavelengths through a single optical fiber path 200 (Figs. 1A and 1B; col. 3, lines 2 to 12).

In Okuno, an input/output port of the first optical transceiver 1 is connected to one end of an optical fiber 10, and the other end of which is connected to a first port of 3-port optical circulator 51. A second port of the optical circulator 51 is connected to an optical fiber 11 which is connected to an input of an amplifier 41. A third port of the optical circulator 51 is connected to an optical fiber 12 which is connected to an output of an amplifier 43. An output of the

amplifier 41 is connected to an optical fiber path 200 through an optical fiber 110 and a 3-port wavelength selective coupler 21. An input of the amplifier 43 is also connected to one end of an optical fiber path 200 through an optical fiber 120 and a 3-port wavelength selective coupler 21 (Figs. 1A and 1B; col. 3, lines 12 to 25).

In Okuno, the optical fiber path 200 comprises a dispersion compensating fiber 20 at its middle to compensate cumulative wavelength dispersion of the signal lights. The other end of the optical fiber path 200 is connected to optical fibers 111 and 121 through a 3-port wavelength selective coupler 22. The optical fiber 111 is connected to an input of an amplifier 42 whose output is connected to a third port of a 3-port optical circulator 52 through an optical fiber 101. The optical fiber 121 is connected to an output of an amplifier 44 whose input is connected to a second port of the 3-port optical circulator 52 through an optical fiber 102. A first port of the 3-port optical circulator 52 is connected to an input/output port of a second optical transceiver 2 through an optical fiber 100. The amplifiers 41-44 essentially include optical isolators so that they cannot be used bi-directionally. Thus, the amplifiers 41-44 are arranged on optical paths between the circulator 51 and the coupler 21 and between the circulator 52 and the coupler 22, through which signal lights propagate in one direction (col. 3, lines 25 to 45).

Okuno, however, discloses only having a dispersion compensating fiber 20 at the middle of the fiber 200 to compensate cumulative wavelength dispersion of the signal lights (col. 3, lines 26 to 28). That is, in Okuno, there is only one regenerator that compensates wavelength dispersion of all signals. In other words, Okuno fails to disclose or suggest having a regenerator for a predetermined group of channels.

The Examiner alleges that Okuno's amplifiers 41 and 44 allegedly anticipate the regenerators as set forth in claim 1. However, in Okuno, the amplifiers 41 and 44 only amplify the signal lights propagated in one direction. Okuno fails to disclose or suggest the amplifier compensating the distortion of the signals. In short, Okuno fails to disclose the amplifiers 41 and 44 compensating for the distortion of the signal as required in claim 1.

Therefore, "each one of the set of channel regenerators regenerates, by compensating for a distortion of a signal, only a predetermined respective group of channels, each respective group forming a non-overlapping subset of a set of channels to be regenerated, and each channel of the groups is predetermined based on channel wavelength," as set forth in claim 1 is not disclosed by Okuno, which lacks having a number of amplifiers that would compensate for the distortion of the signal only for its predetermined group of channels. For at least these exemplary reasons, claim 1 patentably distinguishes from (and is patentable over) Okuno. Accordingly, Applicant respectfully requests the Examiner to withdraw this rejection of claim 1. Claims 2-4, 9, 10, 14, 15, and 20 are patentable at least by virtue of their dependency on claim 1.

In addition, dependent claim 2 recites: "the distortion of the signal is compensated by reshaping, reamplifying, and retiming the signal." As explained above, Okuno only discloses amplifiers that amplify a signal and one single fiber 20 that compensates cumulative wavelength dispersion of the signal lights. Okuno, however, fails to disclose or suggest compensating the distortion of the signal by reshaping, reamplifying, and retiming. For at least this additional reason, dependent claim 2 patentably distinguishes from (and is patentable over) Okuno.

In addition, dependent claim 3 recites: “the set of channels transmits signals from the transmitter to the receiver.” The Office Action alleges that amplifier 41 and amplifier 44 regenerate their respective channel. In Okuno, however, the amplifier 41 amplifies a wavelength that transmits signals to the transceiver 2, whereas the amplifier 44 amplifies a wavelength that transmits signals to the transceiver 1. That is, in Okuno, the dispersion compensating system is bidirectional, where amplifiers for each direction are provided (Fig. 1A; col. 4, lines 4 to 28).

Okuno, however, fails to disclose or suggest having a set of channels that transmit signals in one direction and having different amplifiers for various subsets of the set of channels that transmit the signals in one direction. In other words, Okuno fails to disclose or suggest different amplifiers for different wavelengths that transmit the signals in one direction. In Okuno, different amplifiers are only provided for wavelengths that transmit in different or opposite directions. In short, Okuno fails to disclose the set of channels transmitting signals from the transmitter to the receiver, as set forth in claim 3, where “each one of the set of channel regenerators regenerates ... only a predetermined respective group of channels, each respective group forming a non-overlapping subset of a set of channels to be regenerated,” as set forth in independent claim 1 on which claim 3 depends. For at least this additional reason, claim 3 patentably distinguishes from (and is patentable over) Okuno.

Further, dependent claim 9 recites: “each channel regenerator comprises an inserter/extractor system for isolating channels to be regenerated.” The Examiner alleges that circulator 51 and coupler 21 of Okuno anticipate these unique features of claim 9 (*see* page 4 of the Office Action). Applicant respectfully disagrees.

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That is, with respect to claim 1 from which claim 9 depends, the Examiner alleges that amplifiers 41 and 44 of Okuno anticipate the regenerators as set forth in claim 1. Accordingly, for consistency with claim 1 then, the Examiner needs to show that the amplifiers 41 and/or 44 include an inserter/extractor system.

Applicant respectfully submits that Okuno fails to disclose the amplifiers 41 and 44 including the inserter/extractor. Okuno discloses that the amplifiers 41-44 are arranged on optical paths between the circulator 51 and the coupler 21 and between the circulator 52 and the coupler 22, through which signal lights propagate in one direction (col. 3, lines 25 to 45). That is, Okuno fails to disclose the amplifiers including the circulator and the coupler but instead discloses the amplifier being positioned between the circulator and the coupler. For at least this additional reason, claim 9 patentably distinguishes from (and is patentable over) Okuno.

Next, dependent claim 10, recites: “each channel regenerator comprises a regeneration unit and a compensator amplifier compensating intensity differences between regenerated and non-regenerated channels.” The Examiner alleges that Okuno’s amplifiers 42 and 43 disclose the compensator amplifiers as set forth in claim 10 (*see* page 10 of the Office Action). First, it is respectfully submitted that amplifiers 41, 42, 43, and 44 fail to disclose or suggest compensator amplifiers. Moreover, Okuno fails to disclose or suggest “regenerators and amplifiers” by simple differentiation of the claim elements, these are functionally different elements. Accordingly, amplifiers of Okuno cannot be both the amplifiers and the regenerators. Also, Okuno fails to disclose amplifiers 42 and 43 compensating intensity differences between regenerated and non-regenerated channels. In Okuno, there are no non-amplified channels. For

at least these additional reasons, claim 10 patentably distinguishes from (and is patentable over) Okuno.

Claim 14 recites: “the spacing of said optical regenerators is a multiple of the spacing of said optical amplifiers.” Okuno fails to disclose or suggest the distance between various amplifiers. That is, Okuno does not disclose the spacing between various amplifiers. In other words, Okuno fails to disclose or suggest the spacing between amplifiers 41 and 44 being a multiple of the spacing between amplifiers 42 and 43. For at least this additional reason, claim 14 patentably distinguishes from (and is patentable over) Okuno.

Claim 20, recites: “each regenerator is an independent physical device separate from other channel regenerators in the set, and wherein the set of channel regenerators are sequentially positioned on the optical line.” The Examiner alleges that amplifiers 41 and 44 of Okuno disclose these unique features of claim 20 (*see* page 4 of the Office Action). Applicant respectfully disagrees. In Okuno, amplifiers 41 and 44 are not positioned sequentially on the optical line. On the contrary, in Okuno, the amplifiers 41 and 44 are positioned parallel to each other (Fig. 1A for example). For at least this additional reason, claim 20 patentably distinguishes from (and is patentable over) Okuno.

***Claims 1, 2, 5, 10, and 20 are not anticipated by Grasso***

Claims 1, 2, 5, 10 and 20 are rejected under 35 U.S.C. § 102(b) as being anticipated by WO 98/05133 to Grasso et al. (hereinafter “Grasso”). Applicant respectfully traverses this rejection in view of the following comments.



Of these rejected claims, claim 1 recites: “each one of the set of channel regenerators regenerates, by compensating for a distortion of a signal, only a predetermined respective group of channels, each respective group forming a non-overlapping subset of a set of channels to be regenerated, and each channel of the groups is predetermined based on channel wavelength.” The Examiner alleges that amplifiers 93 and 94 of Grasso disclose the regenerators as set forth in claim 1. Applicant respectfully disagrees.

Grasso discloses a device for adding/dropping optical signals into/from an optical transmission path, including input means for at least two optical signals with distinct wavelengths, comprising: spectral selection means for sending at least a first signal to a first optical path and at least a second signal to a second optical path; at least a wavelength selective switching means along at least one of said first and second optical paths, for adding and dropping at least one optical signal having a predetermined wavelength selected from the optical signal wavelengths (*see* Abstract).

Grasso discloses a bidirectional optical telecommunication system with wavelength-division multiplexing having two terminal stations A and B, each of which includes a respective transmission station 1A, 1B and a respective receiving station 2A, 2B (*see* page 4, lines 1 to 13). Grasso discloses the outputs of each transmitter of transmission stations 1A and 1B are connected to multiplexers 3A and 3B, respectively, which combine their optical signals each toward a single output, connected respectively to the input of optical power amplifiers 5A and 5B. The outputs of these amplifiers are connected to an input port of optical circulators 7A and 7B. An intermediate port of optical circulators 7A and 7B is connected to one end of an optical line 8,

which connects the two terminal stations A and B together (Fig. 1, page 5, line 25 to page 6, line 4).

In Grasso, the optical fiber of optical line 8 is normally a single-mode optical fiber of the step index or dispersion shifted type, conveniently included in a suitable optical cable, and has tens (or hundreds) of kilometers of length between each amplifier, up to the desired connection distance. An intermediate port of optical circulators 7A and 7B is connected to one end of an optical line 8, which connects the two terminal stations A and B together. Inserted along line 8 are bidirectional optical amplifiers 9. Each of them comprises two optical circulators 91 and 92 and two optical amplifiers 93 and 94. An optical amplifier 93 is optically connected between an output port of optical circulator 91 and an input port of optical circulator 92 and an optical amplifier 94 is optically connected between an output port of optical circulator 92 and an input port of optical circulator 91 (Fig. 1, page 6, lines 5 to 20). That is, Grasso discloses a number of bidirectional amplifiers, where a set of channels that are transmitted together in one direction are amplified together.

Similar to Okuno, however, Grasso fails to disclose or suggest an amplifier that compensates for the distortion of the signal lights. That is, in Grasso, amplifiers 93 and 94 only amplify the signal, compensating for the losses of the signals in the past section of the optical fiber (page 6, line 28 to page 7, line 3). Grasso does not disclose having a regenerator which compensate for the distortion of the signal lights for a predetermined group of channels.

Therefore, “each one of the set of channel regenerators regenerates, by compensating for a distortion of a signal, only a predetermined respective group of channels, each respective group

forming a non-overlapping subset of a set of channels to be regenerated, and each channel of the groups is predetermined based on channel wavelength,” as set forth in claim 1 is not disclosed by Grasso, which lacks having a number of amplifiers that would compensate for the distortion of the signal only for its predetermined group of channels. For at least these exemplary reasons, claim 1 is patentably distinguishes from (and is patentable over) Grasso. Accordingly, Applicant respectfully requests the Examiner to withdraw this rejection of claim 1. Claims 2, 5, 10, and 20 are patentable at least by virtue of their dependency on claim 1.

In addition, dependent claim 2 recites: “the distortion of the signal is compensated by reshaping, reamplifying, and retiming the signal.” As explained above, Grasso only discloses amplifiers 93 and 94 amplifying the signals. Grasso, however, fails to disclose or suggest compensating the distortion of the signal by reshaping, reamplifying, and retiming. For at least this additional reason, dependent claim 2 patentably distinguishes from (and is patentable over) Grasso.

Next, dependent claim 10, recites: “each channel regenerator comprises a regeneration unit and a compensator amplifier compensating intensity differences between regenerated and non-regenerated channels.” The Examiner alleges that Grasso’s amplifiers 94a and 93b disclose the compensator amplifiers as set forth in claim 10 (*see* page 5 of the Office Action). Grasso fails to disclose or suggest “regenerators and amplifiers” by simple differentiation of the claim elements. That is, as the terms suggest, these elements are functionally different. Accordingly, the amplifiers of Grasso cannot be both the amplifiers and the regenerators. Also, Grasso fails to disclose amplifiers 94a and 93b compensating intensity differences between regenerated and

non-regenerated channels. In Grasso, there are no non-amplified channels. For at least these additional reasons, claim 10 patentably distinguishes from (and is patentable over) Grasso.

V. Claim Rejections under 35 U.S.C. § 103

Claims 3, 6, 7, 11-13, and 15-19 are rejected under 35 U.S.C. § 103(a). Applicant respectfully traverses this rejection in view of the following comments.

***Grasso in view of Cao***

Claim 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Grasso in view of U.S. Patent No. 6,396,607 to Cao (hereinafter “Cao”). Applicant respectfully traverses this rejection with respect to the dependent upon claim 1, claim 6. Applicant has already demonstrated that Grasso does not meet all the requirements of independent claim 1. Cao is relied upon only for its teachings of a synchronization unit (*see* page 4 of the Office Action). Clearly, Cao does not compensate for the above-identified deficiencies of Grasso. Together, the combined teachings of these references would not have (and could not have) led the artisan of ordinary skill to have achieved the subject matter of claim 1. Since claim 6 is dependent upon claim 1, it is patentable at least by virtue of its dependency.

Moreover, there is no motivation for combining Grasso and Cao. The Examiner alleges that one of ordinary skill in the art would have been motivated to combine the references because Cao support high speed channels (*see* page 6 of the Office Action). Grasso, however, discloses amplifying all signals propagating in one direction together. Accordingly, Grasso would not need the synchronization unit as allegedly disclosed by Cao. In short, Applicant respectfully

submits that one of ordinary skill in the art would not have been motivated to combine Grasso and Cao.

***Okuno in view of Yano***

Claim 7 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Okuno in view of U.S. Patent No. 6,108,125 to Yano (hereinafter “Yano”). Applicant respectfully traverses this rejection with respect to the dependent upon claim 1, claim 7.

Applicant has already demonstrated that Okuno does not meet all the requirements of independent claim 1. Yano is relied upon only for its teachings of a synchronous modulator (see page 5 of the Office Action). Clearly, Yano does not compensate for the above-identified deficiencies of Okuno. Together, the combined teachings of these references would not have (and could not have) led the artisan of ordinary skill to have achieved the subject matter of claim 1. Since claim 7 is dependent upon claim 1, it is patentable at least by virtue of its dependency.

Moreover, one of ordinary skill in the art would not have been motivated to combine the references in the manner suggested by the Examiner. Specifically, the Examiner alleges that one of ordinary skill in the art would have been motivated to include the synchronous modulator of Yano because the repeater of Yano allegedly reshapes the signal (*see* pages 6-7 of the Office Action). Assuming *arguendo* that the repeater of Yano reshapes the signal, it fails to provide motivation for including the synchronous modulator of Yano with the bidirectional system of Okuno. Moreover, Okuno discloses the dispersion compensated fiber 20 which compensates cumulative wavelength dispersion of the signal lights (col. 3, lines 25 to 28). Since Okuno has this dispersion compensated fiber 20, there is no motivation to include the repeater of Yano. For

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at least these additional exemplary reasons, claim 7 is patentable over the combined teachings of Okuno and Yano.

***Grasso in view of Kinoshita***

Claims 11-13 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Grasso in view of U.S. Patent No. 6,023,366 to Kinoshita (hereinafter “Kinoshita”). Applicant respectfully traverses this rejection with respect to the dependent upon claim 1, claims 11-13.

Applicant has already demonstrated that Grasso does not meet all of the requirements of independent claim 1. Kinoshita is relied upon only for its teachings of a four-channel WDM transmission system (which uses repeaters to amplify all channels in the system) and its teachings of a supervisory channel (see page 7 of the Office Action). Clearly, Kinoshita does not compensate for the above identified deficiencies of Grasso. Together, the combined teachings of these references would not have (and could not have) led the artisan of ordinary skill to have achieved the subject matter of claim 1. Since claims 11-13 are dependent upon claim 1, they are patentable at least by virtue of their dependency.

***Grasso in view of Shimomura***

Claims 3 and 15-19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Grasso in view of U.S. Patent No. 6,400,498 to Shimomura et al. (hereinafter “Shimomura”). Applicant respectfully traverses this rejection with respect to the dependent upon claim 1, claims 3 and 15-19.

Applicant has already demonstrated that Grasso does not meet all of the requirements of independent claim 1. Shimomura is relied upon only for its teachings of an amplifier amplifying

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only one channel (*see* page 8 of the Office Action). Clearly, Shimomura does not compensate for the above identified deficiencies of Grasso. Together, the combined teachings of these references would not have (and could not have) led the artisan of ordinary skill to have achieved the subject matter of claim 1. Since claims 3 and 15-19 are dependent upon claim 1, they are patentable at least by virtue of their dependency.

Moreover, the Examiner failed to explain why one of ordinary skill in the art would have been motivated to replace one amplifier of Grasso with a number of amplifiers, as disclosed in Shimomuta (*see* page 8 of the Office Action). In addition, one of ordinary skill in the art would not have been motivated to replace Grasso's amplifiers with the Shimomuta's, as Grasso's amplifiers already amplify the signal. For at least these additional reasons, claims 3 and 15-19 are patentable over Grasso in view of Shimomuta.

#### VI. Allowable Subject Matter

The Examiner indicates that claim 8 would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims. Applicant rewrites claim 8 into its independent form and respectfully requests the Examiner to indicate allowance of claim 8.

#### VII. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly invited to contact the undersigned attorney at the telephone number listed below.

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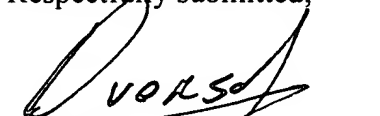
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Date: February 2, 2006

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Dvorson', is written over a horizontal line.

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